

SECTION IV ENVIRONMENTAL SETTING

California presents a variety of environmental conditions ranging from snow-covered peaks of the Sierra Nevada in the east, to the hot dry desert of the Death Valley, with all the possible variations in between these two extremes, as well as one of the world's most scenic and unique coastlines, to the Pacific Ocean in the west. The Sierra Nevada running in a generally north-south direction form the eastern boundary. Between this range and the coast ranges to the West are troughs and valleys, also aligned in a general north-south direction (Palmer 1993). The Sacramento, San Joaquin, and the Imperial valleys in the north, central, and south, respectively, form the major agricultural areas of the state, with the San Joaquin Valley having the distinction of being among the most agriculturally productive areas in the world. In addition to these major agricultural areas, the environmental conditions in California are favorable to specialty crops. For example, the Salinas Valley located in the central coast region is one of the few places in the world where artichokes are grown commercially. Crops grown in the State include most food crops, fruits and nuts, citrus, cotton, and a variety of vegetables. The extensive agriculture in the State has considerable demand on irrigation water; in fact approximately 80 percent of the water use in the State is for agricultural purposes (DWR 1994).

For water quality management, Section 13200(a) of the Porter-Cologne Water Quality Control Act (Porter-Cologne) divides the State into nine different hydrologic regions. Each of these regions is marked by one or more ground water basins (see Figure III-1).

California is a State of geologic contrasts with the highest (Mount Whitney) and the lowest (Death Valley) points in the contiguous United States only 130 kilometers apart. The variety of environmental conditions of the State is a reflection of the variation in geology, topography, climate, elevations, temperatures, vegetation, and land-use found in various areas of the State. These factors, which account for different ecological habitats, as they relate to the nine different regions of the State, are discussed separately below. In addition, brief summaries of water quality conditions in each region are presented. The sources of the information provided in this section are the RWQCB basin plans, unless otherwise specified.

North Coast Region (Region 1)

Porter-Cologne Section 13200(a) describes the North Coast Region as that which comprises all basins including Lower Klamath Lake and Lost River basins draining into the Pacific Ocean from the California-Oregon state line to the southerly boundary of the watershed of the Estero de San Antonio and Stemple Creek in Marin and Sonoma counties.

The northern part of the State bordering Oregon is marked with mountain ranges that include the Klamath Mountains, the Cascade Ranges, and the Modoc Plateau. The Klamaths include a number of individual ranges, particularly the South Fork Mountains, the Trinity Alps, the Scott Mountains, the Salmon Mountains, and the Siskiyou Mountains. The Siskiyou form the

most northerly arc, their trend swinging from north to northeast and east across the California-Oregon border. Average elevation of the crest areas is between 5,000 and 7,000 feet and Thompson Peak in the Trinity Alps rises to an elevation of 8,936 feet. Although lower than the Sierra Nevada crest, the higher parts of Trinity Alps have also been glaciated because of their position in a more northern latitude.

Rivers and dams in this region provide a significant amount of the water of the State. Several valleys formed by the various mountain ranges in the north support aquatic and terrestrial wildlife, as well as agriculture. The northern coastal areas are among some of the most scenic coastlines of the world covering about 340 miles of coastline, with the acclaimed redwoods just inland of the coast, as well as urbanized and agricultural areas.

The North Coast Region is divided into two natural drainage basins, the Klamath River Basin and the North Coastal Basin, encompassing a total area of approximately 19,390 square miles. This region covers all of Del Norte, Humboldt, Trinity, and Mendocino counties, major portions of Siskiyou and Sonoma Counties, and small portions of Glenn, Lake, and Marin counties.

Precipitation in the Pacific Northwest is generally high, varying annually in the Klamath Mountains from 40 to more than 80 inches, occurring mainly during the winter season. Parts of the Klamath River Basin receive between 60 to 125 inches of rain per year. Precipitation, in general, is greater in this region than for any other part of California, and damaging floods are a fairly frequent hazard. Particularly devastating floods occurred in December of 1955, December of 1964, February of 1986, February/March of 1995, and January of 1997.

Ample precipitation in combination with the mild climate found over most of the North Coast Region has provided a wealth of fish, wildlife, and scenic resources. The mountainous nature of the region, with its dense coniferous forests interspersed with grassy and chaparral covered slopes, provides shelter and food for deer, elk, bear, mountain lion, furbearers and many upland bird and mammal species. The numerous streams and rivers of the region contain anadromous fish, and the reservoirs, although few in number, support both coldwater and warmwater fish.

In general, the North Coast Region provides some of the most beautiful natural environments. The coastline is dominated by a narrow coastal plain where heavy fog is common. The rugged forested coastal mountains are dissected by major river systems including the Eel, Russian, Mad, Navarro, and Noyo rivers and numerous smaller river systems. The redwood forests are a distinct feature of this region.

Tidelands, and marshes too, are extremely important to many species of waterfowl and shore birds, both for feeding and nesting. Cultivated land and pasture lands also provide supplemental food for many birds, including small pheasant populations. Tideland areas along the north coast provide important habitat for marine invertebrates and nursery areas for

forage fish, game fish, and crustaceans. Offshore coastal rocks provide nesting sites for many species of seabirds.

The North Coast Region is characterized by distinct temperature zones. Along the coast, the climate is moderate and foggy and the temperature variation is not great. For example, at Eureka, the seasonal variation in temperature has not exceeded 63° F for the period of record. Inland, however, seasonal temperature ranges in excess of 100° F have been recorded.

There are 14 major surface water hydrologic units in the North Coast Region. The region is abundant in surface water and groundwater resources. While the region constitutes about 12 percent of the total area of California, it produces almost 40 percent of the annual runoff for the State. This runoff contributes to flow in surface water streams, storage in lakes and reservoirs, and replenishes groundwater. Throughout the entire region, domestic, industrial, and agricultural water needs are met mainly by surface water. Some water quality problems/concerns do exist, particularly in the North Coastal Basin, and are addressed through the basin plan for the region.

Approximately two percent of the total population of California reside in the North Coast Region. The largest urban centers are located in the Eureka area of Humboldt county and in the Santa Rosa area of Sonoma county, which has experienced the highest population change of all the counties. The major industries of the region are logging and timber milling/production, vineyards and some wineries. The area is also home to many wood product manufacturing facilities, including pulp mills.

Water Quality Conditions

The present water quality within the region generally meets or exceeds the water quality objectives set forth in the basin plan. In most cases the water quality is sufficient to support and, in some cases, enhance the beneficial uses assigned to the water bodies of the region. However, there are a number of present or potential water quality problems which may interfere with beneficial uses or create nuisances or health hazards. Among these are discharges from pulp mills threatening dioxin pollution which is addressed through employing dioxin-reducing measures such as use of oxygen instead of chlorine for bleaching.

The RWQCB staff is involved in a multi-agency Salmon Initiative aimed at development of habitat conservation plans for the protection of coho and steelhead populations at risk in the Klamath River. Efforts are also underway at the RWQCB to reduce wood treatment chemicals being discharged to Parlin Creek Fork of the Noyo River. In addition, timber harvest activities are often in cause violations of basin plan standards.

Willow Creek has experienced a fish population decline and faces impairment threat to drinking water, spawning, and recreational activities. In addition, sedimentation from natural and human sources has impacted beneficial uses.

San Francisco Region (Region 2)

Section 13200(b) of the Porter-Cologne defines the San Francisco Bay Region as that which comprises San Francisco Bay, Suisun Bay, from Sacramento River and San Joaquin River westerly from a line which passes between Collinsville and Montezuma Island and follows thence the boundary common to Sacramento and Solano counties and that common to Sacramento and Contra Costa counties to the westerly boundaries of the watershed of Markely Canyon in Contra Costa county, all basins draining into the bays and rivers westerly from this line, and all basins draining into the Pacific Ocean between the southerly boundary of the north coastal region and the southerly boundary of the watershed of Pescadero Creek in San Mateo and Santa Cruz counties.

The San Francisco Bay/Estuarine system conveys the waters of the Sacramento and San Joaquin Rivers into the Pacific Ocean, contributing almost all the freshwater inflow to the Bay area. Many small rivers and streams also convey freshwater to the area. The rate and timing of these freshwater flows are among the most important factors influencing physical, chemical, and biological conditions in the estuary. Much of the freshwater flow, however, is trapped upstream by dams, canals, and reservoirs of the water diversion projects, providing vital water to industries, farms, homes, and businesses throughout the State. Located on the central coast of California, the Bay system functions as the only drainage outlet for waters of the central valley. It also marks the natural topographic separation between the northern and southern coastal mountain ranges. The region's waterways, wetlands, and bays form the centerpiece of the United States' fourth largest metropolitan region, including all or major portions of Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma counties.

The Bay system presents highly dynamic and complex environmental conditions that support an extraordinarily diverse and productive ecosystem. Within sections of the Bay lie deepwater channels adjacent to large expanses of very shallow water. Salinity levels range from hypersaline to fresh water, with water temperatures varying considerably throughout the Bay system. These factors greatly increase the number of species that can live in the estuary and enhance its biological stability.

Deepwater channels in the Bay system, tidelands, marshlands, freshwater streams, and rivers provide a wide variety of habitats that have become increasingly vital to the survival of several plant and animal species as other estuaries are reduced in size or lost to development. These areas sustain rich communities of crabs, clams, fish, birds, and other aquatic life and serve both as important wintering sites for migrating waterfowl and as spawning areas for anadromous fish.

Most of the region enjoys a milder climate than in inland areas of the State. The coastal parts receive moderate amounts of precipitation.

Major population centers include San Francisco/Oakland and associated Bay areas of San Jose, Santa Clara, and Monterey. The San Francisco Bay and Delta have historically supported major sport fisheries, but lately all major estuarine species are on the decline due to some combination of water diversions, pollution, and habitat loss. In general, the coastal portion south of San Francisco Bay has seen a recent influx of electronic manufacturing industry. The increase in population due to these industrial developments has had its impact on the quantity and quality of water in the area.

Water Quality Conditions

A variety of historical and ongoing industrial, urban, and agricultural activities and their associated discharges degrade waters of the region. Other sources of pollution include the municipal wastewater discharges from various population centers in the region. The RWQCB places a high priority on safe disposal sites for the Bay dredging spoils.

Fish population declines, elevated fish tissue levels, and elevated shellfish tissue levels are common in Carquinez Strait, Richardson Bay, San Francisco Bay (south, central and lower), Suisun Bay, and Tomales Bay. In addition, Tomales Bay has had shellfish harvest closure, impacts from two mercury mines and one quarry, and coliform bacteria from individual septic systems. Fish population declines have also occurred in the Drakes Estero estuary.

Contaminated fish tissue and eutrophication have been noted in almost all lakes and reservoirs of the region, while heavy metals were recorded in Lake Merced.

Rivers and streams impacted by heavy metals include Arroyo Seco, Arroyo Del Valle and Tassajara Creek, while elevated fish tissue levels are seen in Guadalupe Creek and Guadalupe River. Eutrophication and general fish population declines are noted in many smaller creeks in the region.

South San Francisco Bay Wetlands experience impacts from toxic pollutants and heavy metals impact the Suisun Marsh Wetlands. Tomales Bay Wetlands and Walker Creek Marsh experience fish population declines. Shellfish tissue elevations and spawning impairment is also seen in the Walker Creek Marsh.

Central Coast Region (Region 3)

The Central Coast Region is described by Porter Cologne Section 13200(c) as comprising all basins, including Carrizo Plain in San Luis Obispo and Kern counties, draining into the Pacific Ocean from the southerly boundary of the watershed of Pescadero Creek in San Mateo and Santa Cruz counties to the south easterly boundary, located in the westerly part of Ventura county, of the watershed of Rincon Creek.

The region is dominated by a rugged seacoast and three parallel ranges of the Southern Coast Mountains. Ridges and peaks of these mountains, the Diablo, Gabilan, and Santa Lucia

Ranges, reach to 5,800 feet. Between these ranges are the broad valleys of the San Benito and Salinas Rivers. These Southern Coast Ranges abut the west to east trending Santa Ynez Mountains of the Transverse Ranges that parallel the southern exposed terraces of the Santa Barbara Coast.

The trend of the mountain ranges, relative to onshore air mass movement, imparts a marked climatic contrast between seacoast, exposed summits, and interior basins. Variation in terrain, climate, and vegetation account for a multitude of different landscapes. Seacliffs, sea stacks, white beaches, cypress groves, and redwood forests along the coastal strand contrast with the dry interior landscape of small sagebrush, short grass, and low chaparral.

The region has three times the volume of average annual precipitation as the Los Angeles Region, but one seventh the population. However, the region is considered arid for the most part.

Traditionally the region has had agriculture and related food processing as major industries, but oil production, tourism, and manufacturing contribute significantly to the economy. The region is home to the Salinas Valley which is one of a very few places in the world that grow artichokes commercially. Other commercially grown and exported crops in this region include lettuce, strawberries, garlic, and onions. A significant influx of electronic manufacturing industry in the northern part and expanded oil exploration and production in the southern part have taken place lately.

Water Quality Conditions

Surface water quality problems in the region are less frequently evident than groundwater problems because of the general scarcity of surface waters. Bacterial contamination occurs in the coastal waters in Morro Bay and south Santa Barbara county. Also, eutrophication occurs in Pajaro River and Llagas Creek, Salinas River below Spreckels, and in the lower reaches of San Luis Obispo Creek. In addition, highly mineralized conditions in some streams contribute to high salinity of ground waters of the region. Some surface waters contain in excess of 1000 mg/l of TDS.

Heavy metals contamination and elevated shellfish tissue levels occur in Morro Bay, Moss Landing Harbor and Santa Barbara Harbor. Pesticides/herbicides from agricultural runoff have the potential to cause violation of objectives in the Elkhorn Slough, and many of the region's estuaries and lagoons have elevated shellfish tissue levels. Salinas River Lagoon is threatened with ambient toxicity from organic chemicals, while wildlife habitats in it are already impaired. Fish population decline and spawning impairment also occur in many lagoons.

Hernandez Reservoir shows pollution from heavy metals, threat of drinking water impairment, and fish tissue contaminated with mercury. Mercury in fish tissue is also seen in Nacimiento Reservoir.

Fish population decline is common to most of the rivers and streams of the region, which also show high counts of coliform bacteria due probably to individual septic systems. In addition, sedimentation is common in a great majority of the rivers and streams. Heavy metals contamination has been noted in Las Tablas Creek.

Wetlands of the region are generally impaired with elevated fish tissue levels of pollutants. Oso Flako Lake (wetland) has had traces of heavy metals detected as well.

Los Angeles Region (Region 4)

Los Angeles Region is described by Porter Cologne, Section 13200(d) to comprise all basins draining into the Pacific Ocean between the southeasterly boundary, located in the westerly part of Ventura County, of the watershed of Rincon Creek and a line which coincides with the southeasterly boundary of Los Angeles county from the ocean to San Antonio Peak and follows thence the divide between the San Gabriel River and Lytle Creek drainages to the divide between Sheep Creek and San Gabriel River drainages.

Most of the region lies within the western portion of the Transverse Ranges. The San Andreas transform fault system, cuts these western Transverse Ranges. This fault system extending northwesterly for over 700 miles from the Salton Sea in southern California to Cape Mendocino in northern California, bends in an east-west direction to form the "Big Bend". The Transverse Ranges have a conspicuous east-west trend unlike other major ranges in the continental United States which typically have a roughly north-south trend. Major mountain ranges in the region include: San Gabriel Mountains, Santa Susana Mountains, Simi Hills, and Santa Ynez Mountains, with the San Gabriel Mountains being the most prominent range.

Rain storms formed as a result of moist air from the west and northwest being raised by the mountain ranges, are common from November through March, followed by dry summers. Large variations in temperature, humidity, precipitation, and cloud cover, are brought about by the varying topography of the region. The coastal plains and islands, with mild rainy winters and warm dry summers, are noted for their "mediterranean" type of climate. The inland slopes and basins, on the other hand, are characterized by more extreme temperatures and little precipitation. Average annual rainfall in the region, although difficult to determine, is approximately 15 inches.

The geologic and climatic diversity is the basis for diverse plant and animal communities. Chaparral is the most common type of native vegetation, while oak woodland is dominant in some areas. Riparian vegetation associated with the rivers and creeks in the region provides essential habitat and transportation corridors for wildlife, supporting an abundance and diversity of species (Oakeshot 1971).

The diversity in topography and climate of the region has led to the formation of "ecological Islands" supporting many designated unique habitats, as well as rare and endangered species associated with these habitats.

Increasing population in the region in the recent past has led to insufficient water and imported water meets about fifty percent of the fresh water demands of the region. Major watersheds of the region include: Ventura River watershed, Santa Clara River watershed, Calleguas Creek watershed, Malibu Creek watershed, Ballona Creek watershed, Los Angeles River watershed, and San Gabriel River watershed. Much of the water quality in these watersheds is variously impaired. Coastal waters in the region include bays, estuaries, harbors, beaches, and open ocean. Coastal waters are also impacted by activities that include: municipal and industrial wastewater discharges, nonpoint source runoff, oil spills, natural oil seeps, vessel wastes, dredging, development activities, illegal dumping, and offshore operations.

Imported water is utilized in the region through the Los Angeles Aqueducts, the California Aqueduct, and the Colorado River Aqueduct. This water also presents water-quality problems such as turbidity, hardness, and organic pollutants. Treatment of this water leads to other water quality concerns such as trihalomethanes.

Due to the shortage of water in the region, use of reclaimed water is encouraged by the RWQCB.

Water Quality Conditions

Irrigation return flows add nutrients, pesticides, and various other dissolved constituents to some creeks, while high concentrations of DDT and illegal dumping of waste to streams are major contributors to impaired water quality, particularly in the Los Angeles River and its tributaries. Other water quality problems include bioaccumulation of toxic compounds in fish and other aquatic life, impact from sand and other mining operations, natural oil seeps, and eutrophication and accumulation of toxic pollutants in lakes.

Most of the region's bays, harbors, shoreline have elevated levels of PCBs, DDT, chlordane, and PAHs that have resulted in fish consumption advisories and beach closures. Malibu and Mugu lagoons have had elevated levels of arsenic, chromium, nickel, selenium, lead, silver, copper, cadmium, as well as DDT, chlordane, endosulfan, dacthal, toxaphene, and PCBs.

Many lakes have shown high levels of ammonia, copper, zinc, and cadmium, while Lake Calabazas has also shown elevated levels of DDT. Eutrophication is also common among most of the lakes.

A number of rivers and streams of the region have ammonia as a major pollutant leading to toxic amounts in some cases. High levels of TDS is also common among lakes. Wilmington Drain has high levels of copper, lead, and chloride.

Almost all of the recognized wetlands of the region have elevated levels of lead, zinc, chromium, copper, as well as PAHs, DDT, chlordane, dieldrin, PCBs, and dacthal.

Central Valley Region (Region 5)

Section 13200(g) of the Porter Cologne earmarks the Central Valley Region as comprising all basins including Goose Lake Basin draining into the Sacramento and San Joaquin Rivers to the easterly boundary of the San Francisco Bay Region near Collinsville. The Central Valley Region has offices in the Sacramento Valley and the San Joaquin Valley.

The two basins are bound by the crests of the Sierra Nevada on the east and the Coast Range and Klamath Mountains on the west. They extend about 400 miles from the California-Oregon border southward to the headwaters of the San Joaquin River. These two river basins cover about one fourth of the total area of the State and over 30 percent of the State's irrigable land. The Sacramento and San Joaquin Rivers furnish about 51 percent of the State's water supply. Surface water from the two drainage basins meets and forms the Delta, which ultimately drains into the San Francisco Bay.

Principle streams of the Sacramento River Basin are the Sacramento River and its larger tributaries; the Pit, Feather, Yuba, Bear, and American Rivers to the east; and Cottonwood, Stoney, Cache, and Putah creeks to the west. Major reservoirs and lakes include Shasta, Oroville, Folsom, Clear Lake, and Lake Berryessa.

The San Joaquin River Basin covers 15,880 square miles and includes the entire area drained by the San Joaquin River. The principle streams in this basin are the San Joaquin River and its larger tributaries; the Cosumnes, Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, Chowchilla, and Fresno Rivers. Major reservoirs and lakes include Pardee, New Hogan, Millerton, McClure, Don Pedro, and New Melones.

The Sacramento and San Joaquin valleys are among the most agriculturally productive areas of the country and generate most of the income for the region. Much of the irrigation needs of this agriculture are met by a combination of waters from the major rivers, Sacramento, San Joaquin, and American, and groundwater reserves. These rivers are basically fed by snowmelt from the Sierras. The water quality of these rivers and the Delta is threatened, though it is the source of water supply for 20 million people. Two major water projects, the federal Central Valley Project and the State Water Project, deliver water from the Delta to southern California, the San Joaquin Valley, Tulare Lake Basin, the San Francisco Bay area, as well as within the Delta boundaries.

At one point in time the Central Valley wetlands were the finest on the Pacific Flyway for ducks and geese; but according to some estimates, almost 96 percent of these wetlands are no longer there (Oakeshot 1971).

Water Quality Conditions

Significant portions of the major rivers and the Delta are impaired, to some degree, by discharges from agriculture, mines, urban areas, and industries. Upstream tributaries to the major rivers are impaired or threatened because of discharges from mines, silviculture activities, and urban development activities.

Pesticides, and nutrients are major ingredients of agricultural surface drainage. Fish and aquatic wildlife deaths attributable to pesticide contamination of surface water occur periodically. Selenium is another major contaminant in agricultural drainage. Use of herbicides in silvicultural operations has the potential to impact beneficial uses. Discharges of municipal and industrial wastewater are other sources of water quality impairment.

Elevated fish tissue levels are noted in Beach lake, Berryessa Lake, Clear Lake, Don Pedro Reservoir, East Park Reservoir, Kaweah Lake, and Marsh Creek Reservoir.

Fish kills have been noted in Little Backbone Creek while many rivers and streams have fish population declines. Elevated fish tissue levels have been observed in many rivers and streams. Aquatic life impairment and high levels of dioxin occur in the port of Stockton.

Lahontan Region (Region 6)

The Lahontan Region is described by Section 13200(h) of the Porter Cologne as comprising all basins east of the Santa Ana, Los Angeles and Central Valley regions from the California-Oregon boundary to the southerly boundary located in Los Angeles and San Bernardino counties of the watersheds draining into Antelope Valley, Mojave River Basin and Dry Lake Basin near Ivanpah.

The region has historically been divided into North and South Lahontan basins at the boundary between the Mono Lake and East Walker River watersheds. It is about 570 miles long and covers a total area of 33,131 square miles.

The region includes the highest (Mount Whitney - 14,384 feet) and lowest (Death Valley - 282 feet below sea level) points in the contiguous United States, with the rest of the region having a diverse topography. It includes the eastern slopes of the Warner, Sierra Nevada, San Bernardino, Tehachapi, and San Gabriel mountains, and all or part of other ranges including the White, Providence, and Granite mountains. Valleys in the region include the Madeline Plains, Surprise, Honey Lake, Bridgeport, Owens, Antelope, and Victor. The Mojave desert is mainly a plain, dotted with numerous hills and small mountainous groups.

Severe seismic activity has occurred in the region in the past. Volcanic activity has occurred fairly recently in the Mono Lake area and the presence of geothermal springs throughout the region indicates the potential of such activity in future.

Climate within the region varies drastically. The rain shadow areas of the region on the eastern slopes of the Sierra Nevada receive very little rainfall while the peaks register up to 70 inches of average annual precipitation. Most of the precipitation in the mountains is in the form of snow; the desert areas receiving less than 2 inches annually. Temperature extremes recorded in the region vary between 45°F at Boca in Truckee to as high as 134°F in Death Valley.

The varied topography, soils, and microclimates of the region support a corresponding variety of plant and animal life leading to what can be considered "ecological islands". These specialized ecological niches support several specially evolved/adapted plant and animal species, that are unique to these "ecological islands". During the Gold-rush days several sites in the foothills were extensively mined for gold. However, the abandonment of the mines after most of the gold deposits were exhausted, has left this part with a major problem of water contamination originating from these mine sites.

Recreational and scenic attractions of the region include Eagle Lake, Lake Tahoe, Mono Lake, Mammoth Lakes, Death Valley, and many wilderness and scenic river systems. Tourism and resource extraction form the backbone of the economy of the region, while agriculture and defense-related activities make up the rest.

There are over 700 lakes and 3,170 miles of streams in the region. The quality of water in most of the higher elevation water bodies is very good to excellent, being derived from snowmelt. However, desert waters are generally of poor quality because of high concentrations of salt, and minerals such as arsenic and selenium. This is further compounded by nonpoint source geothermal, agricultural, and stormwater discharges. There are few point source discharges.

Municipal and agricultural use of water in the region is low compared to other regions, due mainly to the sparse population and agriculture comprised mainly of pastures rather than row crops or orchards. A large volume of water from the region is allocated by court decisions, federal law, and interstate agreements, to other parts of the State as well as some to Nevada.

Water Quality Conditions

Water quality concerns in the region are largely related to nonpoint sources (including erosion from construction, timber harvesting, and livestock grazing), stormwater, acid drainage from inactive mines, and individual wastewater disposal systems. Point source discharges include wastewater treatment plants, fish hatcheries operated by the Department of Fish and Game, and some geothermal discharges. In addition, hazardous wastes from seven major military installations pose water quality concerns. Erosion into Lake Tahoe carries nutrients in silt and sediment and poses a major concern for this extremely sensitive lake.

Fish kills have occurred in Eagle Lake which has also shown eutrophication. Drinking water impairments occur in Lake Crowley, Echo Lakes (upper & lower), Fallen Leaf Lake, Lake

Tahoe, Donner Lake, Lake Arrowhead, Little Rock Reservoir, and lower Twin Lake. Fish tissue elevated levels are noted in Boca Reservoir, Eagle Lake, Fallen Leaf Lake, Grant Lake, Gull Lake, Haiwee Reservoir, June Lake, Little Rock Reservoir, Lundy Lake, Sabrina Lake, Silverwood Lake, Stampede Reservoir, upper Twin Lake, Bishop Creek Canal, and Bodie Creek. Many lakes and reservoirs are affected by eutrophication, sedimentation, and objectives violations.

Fish kills have been reported from Aspen Creek and Owens River. Owens River has also shown elevated fish tissue levels, fish population decline, toxic bioassay results, and wildlife habitat decrease. Toxic pollutants have been reported from Mojave River, Susan River, and Virginia Creek while pesticides have been detected in Willow Creek. Many of the rivers and streams of the region are impacted by sedimentation.

The saline lakes of the region are impacted by geothermal drainage, agricultural drainage, pesticides/herbicides, arsenic, and trace elements.

Biscar Reservoir wetlands have had fish kills. Arsenic has been detected in Big Springs wetlands, while drinking water impairment has affected Top Spring wetlands. Some wetlands of the region are also affected by geothermal drainage.

Colorado River Region (Region 7)

The Colorado River Basin Region is described by Porter Cologne Section 13200(i) as comprising all basins east of the Santa Ana and San Diego regions draining into the Colorado River, Salton Sea, and local sinks from the southerly boundary of the Lahontan Region to the California-Mexico boundary.

The region covers 20,000 square miles in the southeastern portion of California and includes the Imperial county and portions of San Bernardino, Riverside, and San Diego counties. On the northeastern side it is bounded by the state of Nevada; in the north by New York, Providence, Granite, Old Dad, Bristol, Rodman, and Old mountain ranges; on the west by the San Bernardino, San Jacinto, and Laguna mountain ranges; and on the south by the Republic of Mexico.

A significant feature of the region is the Salton Sea, located on the site of a pre-historic lake, and is the largest inland body of water in California. It is a drainage reservoir for irrigation return water and storm water from Coachella Valley, Imperial Valley, and Borrego Valley, as well as drainage from Mexicali in Mexico.

The well known San Andreas Fault Zone cuts diagonally across the southwesterly portion of the region and borders the highlands on the northeast side of the Salton Trough. Borrego Valley is a typical valley formed by the San Jacinto Fault. The Coachella and Imperial valleys were created when the Colorado River formed a delta that isolated the Salton Trough

from the Gulf of California. Lakes that formed as a result, dried out and left the flat and fertile lands that form the present day valleys.

The Colorado River supplies water for use in the region and elsewhere. Drainage to the river is from a 200-mile long strip of watershed which ranges from 7 to 40 miles in width and is referred to as the East Colorado River Basin. The Metropolitan Water District diverts Colorado River water near the Parker Dam through the Colorado River Aqueduct for export to coastal counties. The Dam forms Lake Havasu. At the Palo Verde Diversion Dam, water is diverted for irrigation in Palo Verde Valley and at the Imperial Dam, water is diverted to the All-American Canal, which conveys water in California to the Bard Valley, and to the agricultural areas of the Imperial and Coachella valleys. Agriculture is the mainstay of the region.

Drainage waters resulting from Colorado River diversions and use, and which do not return to the Colorado River, drain into the Salton Sea. That portion that does not drain into the Colorado River forms the West Basin. Lake Cahuilla in Coachella Valley is also used to store Colorado River water for irrigation and recreational purposes.

The region has the driest climate in California with mild winters and hot summers. Temperatures range from below freezing to 120°F. Higher elevations in the region get snow and the mean seasonal precipitation in the upper San Jacinto and San Bernardino mountains ranges from 30 to 40 inches. The low grounds receive very little rainfall; an average of about four inches along the Colorado River. Precipitation over the entire area occurs mostly from November through April, and August through September.

Many areas in the region are inhabited by animals tolerant to arid conditions, including small rodents, coyotes, foxes, birds, and variety of reptiles. Along the river banks and in the mountains, where water is more abundant, deer, bighorn sheep, and a diversity of small animals exist.

Practically all species of fish found in the region are introduced. Salton Sea provides a considerable amount of sport fishing as well as National Wildlife Refuge areas for waterfowl. The region also provides habitat for certain endangered/threatened species of wildlife including desert pupfish, razorback sucker, Yuma clapper rail, black rail, least Bell's vireo, yellow billed cuckoo, desert tortoise, and peninsular bighorn sheep.

Water Quality Conditions

Agricultural discharges, primarily irrigation return flows, constitute the largest volume of pollution entering surface waters in the region. Mexicali, Mexico continues to discharge raw sewage, industrial wastes, pesticides and other pollutants into the New River. Salton Sea salinity continues to increase, raising concerns about the continuing life of the sports fishery. Levels of selenium in Salton Sea fish sufficient to cause public health concerns have been detected.

Havasu Lake faces threat of elevated levels of selenium in fish tissue, while sedimentation occurs in Finney Lake and Ramer Lake.

Fish kills have occurred in Imperial Valley drains and New River. Toxic bioassay results were reported from Alamo River and Imperial Valley drains, while threat of objectives violation is present for most of the rivers and streams of the region.

Santa Ana Region (Region 8)

The Santa Ana Region is described by Porter Cologne Section 13200 (e) as comprising all basins draining into the Pacific Ocean between the southerly boundary of Los Angeles Region and a line which follows the drainage divide between Muddy and Moro Canyons from the ocean to the summit of San Joaquin Hills; thence along the divide between lands draining into Newport Bay and into Laguna Canyon to Niguel Road; thence along Niguel Road and Los Aliso Avenue to the divide between Newport Bay and Aliso Creek drainages; thence along the divide and the southeasterly boundary of the Santa Ana River drainage to the divide between Baldwin Lake and Mojave Desert drainages; thence along that divide to the divide between the Pacific Ocean and Mojave Desert drainages.

The east-west alignment of the crest of the San Gabriel and San Bernardino mountains separates the Santa Ana River Basin from the Mojave Desert. In the south, the regional boundary divides the Santa Margarita River drainage area from that of the San Jacinto River, which normally terminates in Lake Elsinore. The Santa Ana River cuts through the Santa Ana mountains near Corona and flows down onto the Orange County coastal plain. The Pacific Ocean coast of the region extends from just north of Laguna Beach up to Seal Beach and the Los Angeles county line. Newport Bay, Anaheim Bay-Huntington Harbor, and the coastal wetlands associated with the bays are the other main features of the region.

The region is geologically active because of the San Andreas Fault and its large branch, the San Jacinto Fault; the Elsinore-Whittier Fault; and the Newport-Inglewood Fault all lying within its boundaries. The San Jacinto Fault near San Bernardino affects groundwater flows associated with the Santa Ana and San Jacinto Rivers. The Elsinore-Whittier Fault passes under the Prado Dam at its trends from the northwest toward the southeast. In addition to these major faults, there are many branching, connecting, and parallel faults in the region.

The region was home to extensive agricultural activities including citrus orchards and dairy. While most of the citrus industry has succumbed to growing population pressure, considerable dairy still exists in the region. Both the agricultural activities are considered to have contributed to the heavy nitrate and other salt contamination of the region's groundwaters.

The region is the smallest of the nine regions of the State (2800 square miles) yet one of the most densely populated areas in the State with over four million residents. The climate of the region is classified as mediterranean, being generally dry in summers with mild, wet winters. The average annual rainfall is about fifteen inches, most of it occurring between November

and March. Much of the region would be near-desert but for the influence of modern civilization.

The two major rivers in the region, Santa Ana and San Jacinto, are insufficient to meet the water demands of the population in the region. Water is, therefore, imported and managed by four water districts - San Bernardino Valley Municipal Water District (MWD), Chino Basin MWD, Western MWD, and Orange County WD, through a Santa Ana River Watermaster. These water agencies also formed the Santa Ana Watershed Project Authority (SAWPA), which is a forum for discussion of water issues as well as a joint powers agency that can build projects of common interest to two or more members.

Water Quality Conditions

Mineralization of the region's waters, and its impact on beneficial uses, is a significant water quality problem. Silt, bacteria, metals, PCBs, and the banned pesticide DDT pose problems for Newport Bay. Wastewater discharges to the Santa Ana River often do not meet State health standards and render the river unswimmable. Salts in manure and wash water from dairy operations in the Chino-Corona-Ontario area threaten degradation of groundwater as well as surface water in the Santa Ana River.

Toxic pollutants and heavy metals have impacted Newport Bay, while elevated fish and shellfish tissue levels are seen in Anaheim and Huntington harbors. The estuaries of Anaheim Bay Marsh, Bolsa Bay Marsh, and Bolsa Chica Ecological Reserve face threats of elevated fish and shellfish tissue levels.

Fish kills have occurred in Lake Elsinore and Evans Lake. Eutrophication is seen in Big Bear Lake and Canyon Lake, and is threatened in Baldwin Lake, Filmore Lake, and Jenks Lake. Sedimentation occurs in Big Bear Lake and Evans Lake.

Threat of drinking water impairment looms over Carbon Canyon Creek, Knickerbocker Creek, Lytle Creek, Mill Creek (reach 1), and Mountain Home Creek. Elevated fish tissue levels are seen in San Diego Creek (reach 1, reach 2). Chlorine and ammonia contamination have been noticed in San Timoteo Creek (reach 4) and the Santa Ana River (reach 4). Unknown toxicity was also found in San Timoteo Creek (reach 2). Many rivers and streams of the region are impacted by rising groundwater containing high levels of dissolved solids.

San Diego Region (Region 9)

The San Diego Region is described by Porter Cologne Section 13200(f) as comprising all basins draining into the Pacific Ocean between the southern boundary of the Santa Ana Region and the California-Mexico boundary.

The region encompasses most of San Diego County, parts of southwestern Riverside County and southwestern Orange County. It is situated within the Peninsular Range Physiographic Province of California. One of the most prominent physical features of the region is the northwest-trending Peninsula Range which includes from north to south, the Santa Ana, Agua Tibia, Palomar, Volcan, Cuyamaca, and Laguna mountains. The region is divided into a coastal plain area, a central mountain-valley area, and an eastern mountain-valley area. The coastal plain area is deeply dissected by streams draining to the Pacific Ocean; its surface ranging from sea level to 1200 feet and extending from the coast inland in a band of about 10 miles in width. The central mountain-valley area is characterized by ridges and basins which extend from the coastal plain, northeastward to the Elsinore Fault zone. To the northeast of the Elsinore Fault zone is the eastern mountain-valley area. Surrounding mountains including Red Mountain, Cahuilla Mountain, and Bachelor Mountain, which attain elevations ranging from 4000 to 7500 feet.

The water resources in the region are classified as coastal waters, surface waters, ground waters, imported waters, and reclaimed waters. Coastal waters include bays, harbors, estuaries, beaches, and open ocean. Deep draft commercial harbors include San Diego Bay and Oceanside Harbor and shallower harbors include Mission Bay and Dana Point Harbor. Tijuana Estuary, Sweetwater Marsh, San Diego River Flood Control Channel, Kendal-Frost wildlife reserve, San Dieguito River Estuary, San Elijo Lagoon, Batiquitos Lagoon, Agua Hedionda Lagoon, Buena Vista Lagoon, San Luis Rey Estuary, and Santa Margarita River Estuary are the important estuaries of the region.

There are thirteen principal stream systems in the region originating in the western highlands and flowing to the Pacific Ocean. From north to south these are Aliso Creek, San Juan Creek, San Mateo Creek, San Onofre Creek, Santa Margarita River, San Luis Rey River, San Marcos Creek, Escondido Creek, San Dieguito River, San Diego River, Sweetwater River, Otay River, and the Tijuana River. Most of these streams are interrupted in character having both perennial and ephemeral components due to the rainfall pattern in the region. Surface water impoundments capture flow from almost all the major streams. Many of the surface water impoundments are a blend of natural runoff and imported water.

Imported surface water supplies almost 90 percent of the water used in the region, the remaining 10 percent is made up of other surface water sources discussed above. The Metropolitan Water District (MWD) of southern California supplies this imported water through its member agencies. The Colorado Aqueduct is owned and operated by MWD and has an annual maximum capacity of 1.3 million acre-feet. However, this capacity is limited to 550,000 acre-feet due to a court decision. The MWD also has access to water from the State Water Project (SWP) originating in northern California.

Use of reclaimed water is on the rise in the region. This is obtained through extensive treatment of municipal wastewater to produce a reliable supply for non-potable uses such as irrigation of parks, agriculture, greenbelts, golf courses and freeway landscaping. Population

in the region has been growing at a fast pace and is expected to continue to grow. This would create an increased demand for water.

Water Quality Conditions

Most inland waters of the region and the Pacific Ocean receive pollution in the form of chlorides, sulfates, nutrients, ammonia, residual chlorine, metals, and organic chemicals from municipal wastewater treatment plants. Additional impacts to the surface waters of the region in the form of petroleum hydrocarbons, volatile organic chemicals, TDS, chlorides, and sulfates occur through discharges from remediation and construction de-watering projects. San Diego Bay, Mission Bay, Dana Point, and Oceanside Harbor are impacted by boatyard wastes and the shipyard as well as dredging operations. Several rivers and creeks receive discharges from sand and gravel mining operations, contributing to turbidity and sedimentation. Raw sewage discharges from Mexico continue to contaminate beaches and waterways adjacent to the border.

Cleanup of hazardous waste sites, including abandoned landfills and closed sites on military bases, is an ongoing activity of the RWQCB.

San Diego Bay (north, south, and central) are posted with warnings of fish consumption due to high levels of mercury, copper, PCBs, and PAHs, while almost the entire coastline is contaminated by coliform bacteria.

Eutrophication occurs in a majority of the estuarine areas of the region. Sedimentation occurs in Buena Vista Lagoon and Los Penasquitos Lagoon.

Chromium, copper, lead, zinc, and toxic contamination occurs in Chollas Creek, and ammonia, copper, lead, zinc, DDT, PAHs, PCBs, chlordane, and dieldrin contamination has been detected in Deer Creek. Eutrophication occurs in the Tijuana River and coliform bacteria has been detected in upper and the lower San Juan Creek and lower San Luis Rey River.

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